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THE UNIVERSITY OF ALBERTA

A NON-VERBAL TEST OF ANXIETY FOR CHILDREN

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND

RESEARCH IN PARTIAL FULFILMENT OF THE

DEGREE OF MASTER OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "A Non-verbal Test of Anxiety for Children" submitted by Dorothy June Plunkett in partial fulfilment of the requirements for the degree of Master of Education.

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Supervisor

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Date 1973

DEDICATION

To Muffin and Megan.

ABSTRACT

The study entailed the construction of a non-verbal test of anxiety for children. Existing measures of anxiety were reviewed and found to be paper-and-pencil questionnaires demanding a grade 3 to 4 reading level. Hence, such devices were adjudged unsuitable for primary school children and the rationale for the project was established.

Two basic assumptions led to the formulation of ten manipulative-memory tasks as an initial pool of items. The assumptions were that anxiety has a debilitating effect on motor and on memory responses. A test kit of the ten tasks, complete with an instruction manual was prepared. Thirty children from grades 1, 2, and 3 were given the initial ten item version. From their response data an analysis revealed that six of the ten tasks had discriminatory power. These six tasks or items became the final Primary Anxiety Tasks Test (PATT) utilized for subsequent reliability and validity procedures.

To determine the construct validity of the PATT statistical comparisons were executed between PATT scores and teachers' ratings; between PATT scores and achievement scores; between PATT scores and the General Anxiety Scale for Children (GASC). Moreover, to determine the concurrent validity PATT scores of a normal group of children were compared with a clinically diagnosed emotionally disturbed group of children.

All comparisons were supportive of the validity of

the PATT with the exception that no relationship was found between the PATT and the GASC. Reasons for this latter finding were suggested.

Internal consistency of the PATT was found to be high and acceptable (.77) and test-retest reliability was also elevated and acceptable (.91).

The overall results were discussed and interpreted as evidence that the PATT is a reliable and valid research measure of anxiety in children. An instructional manual and tentative norms are also offered.

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CHAPTER I

INTRODUCTION

Background

The pervasiveness of anxiety in our day has lead it to be called the anxious age (Heffernan, 1966). Through experience and observation every man is aware of the influence of anxiety (May, 1950). Every man is aware of the internal sources of anxiety, the feelings of worry and tension, as well as the external sources of anxiety, the religious, economic, and political situations. General insecurity and uneasiness are the result of the increasing pressure in our way of life. Children too are affected by anxiety (Sarason, Davidson, Lighthall, Waite, and Ruebush, 1960). Although they can adjust to cope with some stress, it tends to be a debilitating factor in their performance (McCandless and Castaneda, 1956; Lott and Lott, 1968; Varhelyi, 1970). The anxious child may develop a physical illness such as an ulcer, an allergy, or asthma. He may develop a nervous stutter or tic (Fleming, 1966). Other symptoms could include perspiration, excessive movements, inappropriate laughter and exclamations, and repeated questioning of instructions (Mandler and Sarason, 1952; Glasser and Zimmerman, 1967). He may be called an under-achiever, a drop-out, a drug-user, an aggressive child, or an indifferent child (Gever, 1970). Like an adult, if the child passes his threshold for anxiety, neurotic behavior

may result (Wolpe, 1958). Except for these possible overt manifestations of anxiety, how can it be measured? Paper-and-pencil questionnaires have been given to adults (Taylor, 1953) and adapted for children (Castaneda, McCandless, and Palermo, 1956). Such self-report scales are inadequate for a child since the results will be effected by his reading ability. A non-verbal test would be more appropriate for the elementary school and kindergarten child.

The purpose of the present study is the construction of a measure of anxiety for children from five to ten years old. The test consists of a set of tasks emphasizing the perceptual and motor abilities rather than the verbal abilities of the child. The instrument is called the Primary Anxiety Tasks Test or PATT hereafter. An initial version of the instrument (ten tasks) was administered to thirty children. From an analysis of their scores, the final form of the PATT (six tasks) was selected.

Construct validation procedures examine the relationship between the PATT and the memory span task, an existing paper-and-pencil measure of anxiety, teacher estimates of anxiety, and school achievement. Concurrent validity procedures compare the PATT results of two groups, emotionally disturbed and normal children. Content validity procedures depend on the author's evaluation of how closely the tasks relate to anxiety. Representative tasks were designed to measure anxiety within the framework formulated in the next section.

The Role of Anxiety

A measure of anxiety is based on an operational definition of anxiety. Before an instrument can be created, the underlying assumptions about anxiety must be delineated. An overview of the role of anxiety in a number of psychological theories precedes a sketch of the concept of anxiety used in this study.

Anxiety is a central concept in theories of personality development. Freud was the first to attempt "to explicate the meaning of anxiety within the context of psychological theory" (Spielberger, 1966, p. 9). Freud described anxiety as an affective state with these attributes: "(1) a specific unpleasurable quality, (2) efferent or discharge phenomena; and (3) the perception of these" (Freud, 1936, p. 70). He believed that anxiety arose as a response to a situation of danger and that its symptoms were created "in order to remove or rescue the ego" (p. 86) from these danger situations. Freud used the trauma of birth as the prototypic experience of anxiety. All later experiences of anxiety signify in some sense, a separation from the mother, "of feeling the loss of the loved (longed for) person" (p. 75). Objective anxiety is the reaction to a real external danger and is natural, rational, and useful while neurotic anxiety is the reaction to an unrecognized instinctual demand and is out of proportion to the danger.

May (1967) views anxiety as "the apprehension cued off by a threat to some value which the individual holds essential

to his existence as a self" (p. 72). Thus the security pattern or the basis of his personality is threatened. An individual's capacity for anxiety is innate but what he regards as a situation of threat to his vital values is largely due to learning (May, 1950, p. 208). Normal anxiety is used to confront these threatening experiences constructively as a part of growth whereas neurotic anxiety is the end result of previously unmet normal anxiety, used to avoid the problem (May, 1967, p. 80). Anxiety is the basic underlying reaction to threat; fear is a differentiated reaction to specific dangers.

Fromm (1941) views development as a process of individuation consisting of two aspects: the growth of self-strength and the growth of aloneness. The first involves the integration of a person's individual personality. The latter involves the awareness of being "an entity separate from all others" (p. 29). This separation creates feelings of doubt, powerlessness, and anxiety. The lag between the two trends of growth makes the anxiety unbearable and a person can react by submission, giving up his individuality by mechanisms of escape, or by a "spontaneous relationship to man and nature" (p. 30), retaining his individuality through productive reasoning, love, and work. Fromm believes that the second alternative is the best way to avoid isolation and the resultant intense anxiety. Happiness and positive freedom are related to this productive orientation. Insecurity, hostility, and

rebelliousness are related to the submissive reaction to anxiety. This alternative makes life possible by reducing the anxiety but does not solve the underlying problem.

Cattell and Scheier (1961) believe that theories based on clinical observation and reasoning must be checked against "precise, standard, clinically meaningful tests" and "multivariate statistical techniques dealing directly and exactly with complex situations and persons" (p. 4). They show that "anxiety is a single factor as a state, closely corresponding to the single factor found as a trait" (p. 182). Trait anxiety reflects stable individual differences in a unitary, relatively permanent personality characteristic. The variables that loaded this factor included ergic tension, ego weakness, guilt proneness, low self-sentiment strength, suspiciousness, tendency to agree, and tendency to embarrassment (p. 57 and 182). State anxiety is a transitory condition of the organism which fluctuates over time. Variables include respiration rate, systolic blood pressure, and electrical skin resistance (p. 181). They conclude that anxiety is a part of but not all of neurosis.

Wolpe (1958) defines anxiety as "the autonomic response pattern or patterns that are characteristically part of the organism's response to noxious stimulation" and calls anxiety "the keystone of all neurosis" (p. 34). Anxiety is the central constituent of learned neurotic behavior since it is always present in the causal situations. Wolpe judges the severity of the neurosis in terms of the intensity and

duration of its unadaptive anxiety.

In the present study anxiety is regarded as a learned response to "threat" which the child incorporates into his behavior patterns. Anxiety becomes part of the child's approach to any situation in his life. It is an important factor in his performance, usually as a negative influence. Anxiety becomes a relatively stable part of the child's personality. Thus, his general level of anxiety can be ascertained. The PATT determines the child's usual level of anxiety by measuring his performance on six tasks. A high score on the PATT reflects a low level of anxiety and a low score reflects a high level of anxiety.

CHAPTER II

RELATED LITERATURE

The review of literature surveys studies related to the nature of anxiety, the relationship between anxiety and performance, and the measurement of anxiety. The review culminates with a statement of the hypotheses which will be empirically tested.

The Nature of Anxiety

Since a description of the nature of anxiety provides the frame of reference for its measurement, several theories of anxiety are reviewed first. The proposals of Gellhorn and Loofbourrow, Wolpe, and Malmo are outlined, followed by the proposals on which the present study is based.

Gellhorn and Loofbourrow (1963) state that "mental and emotional phenomena are inconceivable in the absence of a neural substrate" and that "function without an alteration of substrate pattern is incomprehensible"(p. 3). They suggest that "psychic phenomena are aspects of complex physiological processes peculiar to the brain" (p. 141) and therefore stress the leading role of the neurophysiological activity in the psycho-physiological relationship.

Although the psychological concomitants of the physiological processes may vary from a dim awareness to alertness, living matter is always in a state of activity involving the expenditure of energy to maintain patterns of organization "which confer upon the living organism the

property of excitablility and the ability to make appropriate adjustments to changing conditions" (p. 20). Integration of the various body processes is achieved largely through the nervous and endocrine systems. The peripheral nerves or receptors send impulses to the central nervous system which programs the activities of the organism. The effectors (muscles and glands) carry out the adjustment of body functions in response to the nervous and hormonal messages. Through changes in glandular and muscle activity the entire organism is made to participate in emotional phenomena.

The hypothalamus is the most prominent link between the nervous and endocrine systems. It regulates the sympathetic and parasympathetic divisions of the autonomic nervous system with the endocrine regulation which this implies and is instrumental in determining the output of the pituitary or master gland. Gellhorn and Loofbourrow (1963) suggest that the patterns of emotional excitement are similar to those produced by hypothalamic stimulation. There is an "autonomic downward hypothalamic discharge leading to disturbances in the internal organs" as well as "an upward discharge leading to generalized cortical excitation" (p. 67). Sympathetic and parasympathetic effects occur with the autonomic downward discharge usually with a predominance of the former. Sympathetic changes include an increase in heart rate, in palmar conductance, and in systolic blood pressure. Parasympathetic changes include weeping and frequent voiding of the bladder and bowel. Hormonal changes include an increase

in secretion of adrenaline which means an increase in the concentration of blood sugar. Anxiety has been shown to be associated with less activity of the gastrointestinal tract, dilatation of the pupils, pallor of the skin, a dry mouth, and less motility and secretion in the mucous membrane of the nose (pp. 71 - 72). These symptoms suggest that increased sympathetic activity accompanies the state of anxiety. Although Gellhorn and Loofbourrow suggest that different emotional states are associated with different types of autonomic discharge, they caution that "the emotional reactivity of different persons varies within wide limits" (p. 74).

The downward hypothalamic discharge in emotional excitement also involves the somatic nervous system to some extent. Muscle activation observed through facial expressions, posture changes, and motor responses will occur.

The upward hypothalamic discharge accompanying emotional excitement results in diffuse cortical activation. Gellhorn and Loofbourrow state that "emotional excitement has a profound influence on the activity of the brain" (p. 78), and hence on the human mind. They illustrate one hypothalamic-cortical relation in man. The alpha potentials recorded by the electroencephalogram (EEG) of a normal person in a relaxed state are about 10/second. These potentials disappear when the subject is in a state of anxiety. Hypothalamic stimulation leads to increased activity in the neocortex which is "essential to the subjective

interpretations of internal states i.e., to the affect or feeling in emotion" (p. 40).

Wolpe's (1958) theory about the nature of anxiety seems to support Gellhorn and Loofbourrow's proposals. Wolpe defines anxiety in terms of "the autonomic response pattern or patterns that are characteristically part of the organism's response to noxious stimulation" (p. 34). Noxious stimulation causes tissue disturbance of a kind that tends to lead to avoidance or withdrawl behavior and correlates with the experience of pain or discomfort. The manifestations of anxiety responses are largely those "associated with a widespread discharge of the autonomic nervous system, and predominantly of its sympathetic division" (p. 35); for example, tachycardia (abnormally rapid heart-action), pilo-erection, raised blood and pulse pressures, palmar hyperhidrosis, and dryness of the mouth. Parasympathetic effects may include evacuation of the bladder or bowels. A rise in muscle tension shown as increased irritability, restlessness, or tremor may be a somatic response. Like Gellhorn and Loofbourrow, Wolpe believes that the distribution of these effects varies with the individual and also with differences in the details of the emotional state.

Further, Wolpe suggests that anxiety "may undermine the functioning of the organism in many ways" (p. 36). It may produce headaches, interfere with sexual performance, diminish the registration of impressions, and cause

embarrassment in certain social situations (and consequently avoidance of them). Secondary reactions include "bizarre feelings" (p. 36) which may be directly alarming or which may cause the person to believe that he is losing his mind. Special complications involving the nose, stomach, respiratory, and blood pressure may eventuate as peptic ulcers, asthma, cerebral strokes, or heart attacks.

According to Wolpe, anxiety responses are unadaptive learned forms of behavior and are very difficult to extinguish. Anxiety is usually the central constituent of neurotic behavior with the severity of the neurosis depending on the amount of unadaptive anxiety. The consequences of these unadaptive anxiety responses are unfavourable to the organism; for example, no progress toward the satisfaction of a need, the occurrence of damage or deprivation, or the wasteful expenditure of energy. Almost invariably, the neurotic reactions "have disadvantageous results for the individual" (p. 33).

Malmo (1957) uses the term arousal to refer to the intensive dimension of behavior. He suggests measuring this physiological intensity by making gradients for skeletal muscle tension, heart rate, blood pressure, and respiration. For a normal person, the most efficient performance appears to occur with intermediate physiological levels of arousal. Malmo assumes that underarousal involves poor motivation and overarousal, emotional interference. Both result in inferior performance. Since Malmo refers to anxiety as a

pathological state developed over a long period of high arousal, a lower level of performance similar to that caused by overarousal is implied.

The theory on which the present study is based consists of several dimensions of anxiety. The physiological correlates include hormonal, somatic, parasympathetic, and sympathetic activity. The psychological correlates include awareness, interpretation and labelling of the feeling. The behavioral correlates include the response patterns cued off by conditioned stimuli.

The entire organism, then, participates in this complex emotional occurrence. Although alterations of the neurophysiological substrate of anxiety are too difficult to measure in this study, somatic activity such as facial expressions, posture changes, and motor responses may be observed and recorded as supporting evidence during the testing session. Information about the psychological concomitants of anxiety can also be collected during testing as the subject makes comments about the tasks, the test situation, and his performance. The behavioral responses of the subject provide the most precise data as he completes the subtests of the PATT. The subject's performance score reflects his level of anxiety.

Anxiety and Performance

That a low score on the PATT, indicating poor performance on the six tasks, reflects a high level of anxiety is an underlying assumption of this study. A large

number of studies support this view as past research has suggested that the performance of high anxiety children is inferior to that of low anxiety children as measured by a variety of standards. Most such research relates anxiety to learning tasks, problem-solving tasks, reading tasks, school achievement indices, and general intelligence tests. Relevant and exemplary studies are reviewed hereafter.

In experimental learning situations including visual-motor and verbal tasks, the low anxiety subjects generally had better scores (Stevenson and Odom, 1956), made fewer errors (Knight, 1965), or needed less time (Waite, Sarason, Lighthall, and Davidson, 1958). Stevenson and Odom (1965) concluded that anxiety has the most disruptive effect on performance in tasks involving verbal processes. Particularly on the more difficult components of the task and in more complex learning tasks, anxiety has been found to interfere with performance (Castaneda, Palermo, and McCandless, 1965; Palermo, Castaneda, and McCandless, 1956). Also, convergent thinking as represented by the School and College Achievement Test and by the Sequential Test of Educational Progress has a significantly negative correlation with anxiety (Feldhusen, Denny, and Condon, 1965).

The high anxiety child is less effective in a problem-solving situation as well. The child may be required to independently solve a problem in which the stimuli are relatively unfamiliar, there are no right or

wrong answers, and the examiner has a non-directive role. Several personality measures have been used in different studies. The Rorschach (Sarason, Davidson, Lighthall, and Waite, 1958a), human figure drawings (Fox, Davidson, Lighthall, Waite, and Sarason, 1958), and the Holtzman Inkblot Technique and a word association task (Doris, Sarason, and Berkowitz, 1963) are examples. In the Rorschach study, the high anxiety child gave responses reflecting illogical or irrational ways of thinking and tended not to incorporate the obvious properties of the stimuli. In the figure drawings study, the high anxiety child drew more primitive figures which lacked important parts of the body, were more rigid, and were less playful. The researchers suggested that some concern with body integrity and adequacy related to anxiety. Silverstein's study (1966) supported these results, the quality of the drawings of the high anxious children being significantly poorer. Anxiety interfered with accuracy, spontaneity, and expressiveness. In the Inkblot and word association study, the low anxiety group had highest scores on form level and quickest reaction time on emotional words. Children's performance on the Holtzman has also been studied by Swartz (1965). In his study, the low anxiety group gave twice as many responses with adequate or good form when the entire blot was used and did better on three inkblot variables--movement, barrier, and affect arousal.

Reading, an essential skill for the elementary school

child, is effected by anxiety. Slower reading speed and less comprehension were associated with higher anxiety level in a study by Gifford and Marston (1966). In several studies by Phelps (1968), lower anxiety children consistently scored higher in reading achievement. School achievement and general intelligence both correlate negatively with anxiety (McCandless and Castaneda, 1956; Zweibelson, 1956). Although the correlations are small, they are significant. A typical study was done by Feldhusen and Klausmeier (1962). Testing 120 grade five children, they found negative correlations, significant at the .01 level, between anxiety as measured by the Children's Manifest Anxiety Scale and intelligence as measured by the Wechsler Intelligence Scale for Children, and between anxiety and achievement as measured by the California Achievement Battery, including reading, arithmetic and language. Waite, Sarason, Lighthall, and Davidson (1958) caution that since intelligence and achievement scores are obtained in a test situation, they already reflect the interfering effects of anxiety. This assumption should be considered when describing individuals as less intelligent or lower achievers, and when comparing groups matched on intelligence or achievement scores.

In some performance situations "the HA child is not experiencing anxiety to the degree that it is interfering, but it is unjustified to refer to the facilitating effects of anxiety" (Sarason et al, 1960, p. 186). In studies by Sarason's group, the support of the examiner and the child's

opportunity to check responses seemed to benefit the high anxiety child. In a study by Zweibelson (1956), a more game-like atmosphere decreased the interference of anxiety. Lekarczyk and Hill (1969) suggested that examiners of the same sex as the subject have a greater potential for eliciting anxiety than opposite sex adults. More anxious behavior was exhibited by girls and by inner city children in a study by Hawkes and Koff (1970) and by first-born children in a study by Zucker, Manosevitz and Lanyon (1968).

The experimental evidence generally supports the contention that high anxiety undermines the child's functioning. Poor performance corresponds to a high level of anxiety.

The Measurement of Anxiety

The PATT, based on a child's task performance, is proposed as a more suitable measure of anxiety for children after considering the limitations of several scales of anxiety presently in use.

Measures of anxiety have commonly been paper-and-pencil questionnaires such as Taylor's Manifest Anxiety Scale (MAS) developed in 1953. The items for this scale, chosen from the Minnesota Multiphasic Personality Inventory, were judged by clinicians as describing overt or manifest symptoms of anxiety. Taylor (1953) assumed that defining the intensity of anxiety "in anxiety-scale scores is a perfectly legitimate operational procedure" (p. 290). Adapted from Taylor's adult form, the Children's Manifest

Anxiety Scale (CMAS) "provides a method for measuring the level of drive with the immediate purpose of attempting to determine its role as a determinant of performance in children" in grades four, five, and six (Castaneda, McCandless and Palermo, 1956, p. 317). The underlying assumption, then, is that highly motivated children will be more anxious. The lie scale (L) is "an index of the subject's tendency to falsify his responses to the anxiety items" (p. 318) and represents the authors' attempt to measure the subject's test-taking attitude including distortions related to lying, set, and defensiveness (Rie, 1963). The CMAS has been used in studies relating anxiety to social desirability (Lunneborg, 1964), self-concept (Lipsitt, 1958), achievement (Cowen, Zax, Klein, Izzo, and Trost, 1965), and intelligence (Lott and Lott, 1968). Although both the MAS and CMAS purport to be measures of manifest anxiety, do the responses to these scales reflect behavioral manifestations of anxiety? Utilizing verbal responses to a questionnaire may not be as appropriate a method of measuring manifest anxiety as recording observations of overt behavior or results of performance tasks.

In an item analysis of the CMAS, Hafner and Kaplan (1959) suggested that "most of the anxiety items would be answered affirmatively if they were so qualified [with sometimes or at times] since the items refer to behavior experienced by most people at one time or another" (p. 483).

They also questioned the appropriateness of some of the items regarding their inference of anxiety. (For example, item 20, "I get angry easily."

The Alpert-Haber Achievement Anxiety Scale for Children (AASC) is another paper-and-pencil test adapted from an adult scale (Stanford, Dember, and Stanford, 1963) with items meaningful to grade three students. According to the authors, it is a measure of test anxiety and a good predictor of school grades. A combination of IQ and AASC scores apparently provides an excellent multipredictor of academic performance. The usefulness of this scale seems to be limited to this purpose.

The Test Anxiety Scale for Children (TASC) was developed by Sarason, Davidson, Lighthall and Waite (1958b) as part of their effort to present more systematic research on anxiety. They were concerned with elementary school children (grades two to five) and their anxiety in test or test-like situations largely because of "indications in the literature that fear of school failure was one of the most common of worries or fears among children" (p. 105). They suggested that the understanding of test anxiety "will have significance for our understanding of anxiety in general" (Sarason et al, 1960, p. 2). The authors found significant relationships between TASC scores and teacher ratings, Otis Alpha group intelligence scores, and Stanford Achievement results (Sarason et al, 1958b). The TASC has been used as a measure of anxiety by others as well (Hill,

1967; Ruebush and Stevenson, 1964). In contrast to Sarason's hypothesis, a study by Dunn (1964) indicated that the TASC is not a homogeneous measure of test anxiety but rather a measure of school anxiety.

The General Anxiety Scale for Children (GASC) was constructed to study the relationship between anxiety in test-like situations and anxiety in other types of situations (Sarason et al, 1960). A lie scale is embedded in the GASC to identify and measure one source of error in self-reports.

I. G. Sarason (1960) suggested that anxiety scores are explainable in terms of the subject's test-taking attitude since paper-and-pencil scales only measure "the extent to which an individual is willing to admit to experiencing anxiety in certain situations" (p. 409). High scores may be obtained from subjects who are particularly open and frank, who are particularly perceptive of their own reactions, or who tend to attribute 'bad' characteristics to themselves. He suggested that the main reason for the wide use of such tests was convenience and that other measures may be less convenient but more useful. "More research designed to measure anxiety in a variety of ways ... seems indicated" (p. 410).

Discrepancies in self-report scales may also be the result of memory distortions, that is, faulty recall of past experiences or the result of inadequate testing in the here and now (Sarason, 1966, p. 76). Interpretations of high

anxiety scores should consider that these may include reflections of the child's coping tendencies, the consequences of anxiety (usually learning how to avoid it) rather than anxiety itself.

No adequate measure of anxiety for children is presently available. The study will involve development of a test specifically designed for children, not a revision of an adult form. It will be composed of a set of tasks emphasizing the child's performance. This will eliminate the intentional and unconscious distortion of responses inherent in self-report questionnaires as well as reach lower-aged children, non-readers, primer readers, and poor readers who would be handicapped by a verbal scale. The structure of this measure implies a less test-like situation than the paper-and-pencil scale, lowering the subject's interfering test-taking attitude. Also, since this is an individual test, the examiner can observe the child's behavior and use the implications of his behavior manifestations as supplemental information.

Test validation utilizes three construct criterion. The relationships between the PATT and an existing measure of anxiety, teacher estimates of anxiety, and school achievement are investigated.

HYPOTHESES

The general hypothesis which subsumes the specific hypotheses is that subjects who demonstrate low and high

scores on the experimental test will be rated as high and low anxious by the validation measures.

1. Subjects with a low score on the PATT will be rated as high anxious by an existing measure of anxiety.
2. Subjects with a low score on the PATT will be rated as high anxious by teacher estimates of anxiety.
3. Subjects with a low score on the PATT will be rated as high anxious by school achievement scores.

CHAPTER III

CONSTRUCTION OF THE PRIMARY ANXIETY TASKS TEST

Rationale

In the present study, anxiety is viewed as an interfering factor in a child's performance. Anxiety seems to relate to lack of concentration and poor attention. Using random approaches to problem solving is another characteristic. Erratic movements such as fumbling or shuffling may be overt signs of anxiety as well as hesitant responding and much questioning (Glasser and Zimmerman, 1967). Generally indications of disorganization reflect the interference of anxiety.

These effects are evident in a child's performance on the digit span subtest of the Wechsler Intelligence Scale for Children. Wechsler (1958) said that "low scores on the Memory Span Test ... can be due to anxiety or inattention ... difficulty in the reproduction of digits correlates with lack of ability to perform tasks requiring concentrated effort" (p. 71). Regarding the digit span subtest, Glasser and Zimmerman (1967) suggested that "very commonly ... a low score is due to the presence of manifest anxiety" (p. 98). Rapaport, Gill and Schafer (1968) agreed stating that "the extent to which Digit Span is impaired appears to indicate the presence and degree of anxiety"(p. 117).

Devising a simple rote memory retrieval task similar to Digit Span seemed to be the logical beginning for a

measure of anxiety. Other ideas were obtained from studies using tests like the Witkin's Embedded Figures Test and the Porteus Maze Test, from children's magazines such as Highlights for Children and Child Life, and from children's toys and games.

Tasks in which anxiety seemed to be an interfering factor were designed and given to a number of children. Ten tasks were chosen for the initial version of the PATT.

Task Analysis Procedure

The initial version of the PATT was administered to thirty children from the Devon Elementary School. This group was a stratified random sample consisting of ten students from each of grades one, two and three with an equal number of boys and girls.

The results of the analysis performed on the scores of these subjects are depicted in Table 1. The correlations between each task and the Memory Span subtest as well as between each task and the total are included.

Final Task Selection

Tasks 2, 3, 4 and 7 exhibited the lowest correlations with the Memory Span subtest. Tasks 2 and 3 exhibited the lowest correlations with the total. Pegboard, Knot-tying, Three-of-a-kind, and Pathfinding were eliminated on this basis. The revised version of the PATT consists of the six best indicators of anxiety designated by an asterisk in Table 1.

TABLE 1

TASK-MEMORY SPAN AND TASK-TOTAL CORRELATIONS FOR THE INITIAL PATT

PATT TASK	TASK-MEMORY SPAN r	TASK-TOTAL r
1. Hidden Objects	.39	.63*
2. Pegboard	.30	.36
3. Knot-tying	.09	.35
4. Three-of-a-kind	.29	.56
5. Tower-building	.38	.53*
6. Card-sorting	.51	.49*
7. Pathfinding	.32	.69
8. Oval Assembly	.46	.60*
9. Memory Span	1.00	.69*
10. Sequential-picture-making	.40	.70*

THE FINAL PATT

The PATT consists of six tasks for children from the ages of five to ten years. The subject is required to follow oral instructions. Initially, he is told to do as well as he can and to work as fast as he can.

Memory Span

The Memory Span task consists of a pegboard, coloured chips with a hole in the center, and fourteen cards, in two sets with two to eight chips. The first set of cards is exposed one at a time for the number of seconds

corresponding to the number of chips on it. The child places the same coloured chips on the board in front of him. If he makes a mistake, the child has another chance using the alternate card from the second set. The subject's score ranges from two to sixteen, that is, two times the highest number of chips recalled correctly.

Oval Assembly

The Oval Assembly task consists of an oval on a cardboard sheet divided into eight different coloured shapes and of eight puzzle-like pieces of the same shapes but different colours. As quickly as he can, the child places the pieces on the oval, matching the shapes. A maximum of three minutes is allowed. The subject's score ranges from zero to seven, that is, one-half the number of pieces placed correctly within the time limit plus a possible bonus of one to three points for faster performance.

Hidden Objects

The Hidden Objects task consists of a black-and-white picture of a girl raking with thirteen objects inappropriately placed in the scene. The child finds as many of these hidden things as he can. A maximum of three minutes is allowed. The subject's score ranges from zero to thirteen, that is, one point for each hidden object adequately identified within the time-limit.

Tower-building

The Tower-building task consists of twenty-six coloured cubes, a diagram of the demonstration tower for the examiner, and a cardboard screen. First, the child makes a single tower as high as he can; secondly, he copies the examiner's demonstration tower as fast as he can. The demonstration tower is built by the examiner behind the screen, then exposed and left in the child's view. The subject's score ranges from zero to fourteen points, that is, one-half the sum of the number of blocks in his tower in part one and of the number of blocks copied accurately with a possible bonus of one to three points for faster performance in part two.

Card-sorting

The Card-sorting task consists of thirteen cards with one or two different triangles or circles drawn on each and a blank sheet of paper. The child is asked to identify a circle and a triangle drawn by the examiner on the paper. The child then sorts the cards into three piles so that the cards in each pile belong to the same group, either triangles, circles, or a combination. A maximum of three minutes is allowed. The subject's score ranges from zero to ten points, that is, one-half the number of cards grouped correctly within the time limit plus a possible bonus of one to three points for faster performance.

Sequential-picture-making

The Sequential-picture-making task consists of seven rectangular cards with an incomplete picture at both ends. The child joins the cards together to complete the pictures, placing the cards end-to-end into one long line. A maximum of two minutes is allowed. The subject's score ranges from zero to eight points, that is, the number of correct joins plus a possible time bonus of one to three points.

The total amount of time required to complete the PATT is about twenty minutes. A score with a fraction is always rounded to the next higher number. A maximum possible score is sixty-eight; the higher the score, the lower the level of anxiety. A two-page record form has space for personal data and for scoring. A manual of instructions includes a description of the materials, procedure, scoring, and timing. The appendix contains a copy of the record form and manual.

This final version of the PATT was administered to twenty-nine children. The scores of the Devon children were adjusted to the shortened form of the PATT, making an N of 59 for the final correlational analysis. The results appear in Table 2.

Validity Considerations

Content validity of the instrument was established through the visual inspection and reasoning of two researchers intimate with the underlying concepts of anxiety. The six tasks of the PATT were also designed to represent a broad

TABLE 2

TASK-TOTAL CORRELATIONS FOR THE FINAL PATT

	PATT TASK	TASK-TOTAL r
1.	Hidden Objects	.80
2.	Tower building	.66
3.	Card-sorting	.64
4.	Oval Assembly	.67
5.	Memory Span	.71
6.	Sequential-picture-making	.65

The correlations are all significant beyond the .01 level. Each subtest is contributing to the measurement of anxiety.

sampling of perceptual and motor activities to measure the debilitating effects of anxiety on a child's performance.

Construct validity was established through comparison of the scores on the PATT with scores on the GASC, a teachers' rating scale, and the three subtests of the Wide Range Achievement Test. The results will be discussed in Chapter V.

Construct validity was also established through correlation of the Memory Span subtest with the other tasks and the total with an N of 59. The results of the correlational analysis are presented in Table 3.

Concurrent validity was established through comparison of the scores obtained by children attending the Glenrose School Hospital and by children attending

TABLE 3

TASK-MEMORY SPAN CORRELATIONS FOR THE FINAL PATT

PATT TASK	TASK-MEMORY SPAN r
1	.44
2	.26
3	.42
4	.37
6	.37
Total	.71

The correlations are all significant beyond the .05 level.

regular schools. The Glenrose pupils have been clinically diagnosed as emotionally disturbed. Telford and Sawrey (1967) and Gever (1970) suggest that anxiety is probably basic to all forms of maladjustive behavior as well as to the neuroses and the more severe psychoses. Problem behavior then, is often the result of anxiety. The pattern of problem behavior of the emotionally disturbed child may include unsocialized aggression, hyperactivity, inattentiveness, lack of self-confidence, and fearfulness (McCarthy and Paraskevopoulos, 1971, p. 180). These behavior mechanisms should lower the level of performance of the disturbed group of children on the PATT tasks.

The N of 44 consisted of subjects between the ages of seven years zero months and ten years eleven months,

twelve from the Glenrose and thirty-two from regular schools in Edmonton and Devon. The results of the T-test analysis of the difference between their scores appear in Table 4.

TABLE 4

SUMMARY OF DIFFERENCES BETWEEN PATT SCORES FOR EMOTIONALLY DISTURBED AND NORMAL CHILDREN

PATT	EMOTIONALLY DISTURBED			NORMALS			DIFFERENCES		
	N	X	SD	N	X	SD	DF	T	P
1	12	6.92	4.08	32	9.25	2.55	42	2.28	0.01
2	12	10.42	2.27	32	11.59	1.06	42	2.27	0.01
3	12	3.42	1.44	32	4.91	1.65	42	2.75	0.00
4	12	4.33	1.67	32	4.50	1.48	42	0.32	0.37
5	12	5.50	1.73	32	7.56	2.63	42	2.51	0.01
6	12	4.50	1.73	32	4.56	1.97	42	0.10	0.46
Total	12	35.08	9.98	32	42.38	8.06	42	2.51	0.01

There were significant differences between the total scores of the emotionally disturbed group and the normal group as well as between their scores on tasks 1, 2, 3 and 5.

Reliability Estimates

Ten children were tested and retested within a six month period. The estimate of reliability obtained by this procedure was .91.

An internal consistency measure using the KR-20

formula, yielded an estimate of .77 with N=59.

Norms

Analysis of variance procedures revealed differences between three groups separated according to age. Age norms were established for the PATT using the forty-seven children from regular schools. Group 1 consists of children aged five years zero months to six years eleven months; Group 2, seven years zero months to eight years eleven months; and Group 3, nine years zero months to ten years eleven months. The results are presented in Table 5.

TABLE 5

TENTATIVE AGE NORMS FOR THE PATT

AGE GROUPS	NUMBER	MEAN	STANDARD DEVIATION
5-0 to 6-11	15	32.73	4.71
7-0 to 8-11	19	39.53	8.28
9-0 to 10-11	13	46.54	5.77
Total	47	39.30	8.34

The differences between the groups are significant beyond the .001 level. One girl, aged 7-7, had a PATT score of 54. Interpreted according to these norms, she displays a low level of anxiety. One boy, aged 7-4, had a PATT score of 29. He displays a high level of anxiety.

CHAPTER IV

DESIGN AND PROCEDURE

The Sample

The sample comprised fifty-nine children from five to ten years old. Thirty children attending Devon Elementary School were administered the original PATT during school hours. Seventeen children from Edmonton schools were administered the revised PATT in their home or in the examiner's home. Twelve children attending the Glenrose School Hospital, and who were clinically diagnosed as emotionally disturbed, were administered the revised PATT during school hours.

Procedure

The PATT, the GASC, and the WRAT were administered in that order. The GASC was administered to small groups of Devon children; otherwise, the subjects were tested individually. Testing usually took place in a quiet room with a comfortable table and chair for the child. With the original PATT, testing was completed in three sessions, requiring about seventy minutes. With the revised PATT, testing was completed in one session, requiring about forty-five minutes.

INSTRUMENTS

The General Anxiety Scale for Children (GASC)

The GASC was developed by Sarason, Davidson, Lighthall, Waite and Ruebush (1960) in conjunction with the TASC. A paper-and-pencil test, the GASC consists of thirty-four yes-or-no type questions related to the common worries and fears of an elementary school child. A lie scale of another eleven items is embedded in the questionnaire. The GASC has been used in a number of studies by the authors and others (Bryson, 1968; Feldhusen, Denny, and Condon, 1965) under the assumption that it is a valid measure of general anxiety. Validity seems to derive from its association with the TASC.

To simplify admininistration in the present study, the examiner read the questions out loud, omitting the lie scale. The child circled yes or no for each item.

The Wide Range Achievement Test (WRAT)

At Level I (age 5-0 to 11-11), the WRAT consists of three subtests - reading, spelling and arithmetic. The reading subtest measures recognizing and naming letters and pronouncing words; the spelling subtest, copying marks resembling letters, writing the name, and writing single words to dictation; and the arithmetic subtest, counting, reading number symbols, solving oral problems, and performing written computations (Jastak and Jastak, 1965, p. 1).

The normative population consisted of 5868 children from seven states. Jastak and Jastak (1965) made

probability samplings based on IQ's intending "to develop WRAT norms that would correspond to the achievement of mentally average groups with representative dispersions of scores above and below the mean" (p. 9).

Jastak and Jastak report reliability scores of .85-.92 for arithmetic, .92-.98 for reading and spelling, and .94-.99 for internal consistency. They also suggest that test results compare favorably with external criteria such as chronological age, teachers' ratings, educational level, and other achievement tests. A general factor, probably intelligence, partially determines the level of each of the subtests.

The WRAT was administered and scored according to the instructions outlined in the manual.

Teachers' Rating Scale

This scale, developed by Sarason et al (1960), consists of seventeen questions related to the child's classroom behavior including his reactions to time pressure, blackboard work, recitation, and tests. The child's behavior is described by a five-point scale on which zero means not characteristic of the child and one to four represent increasingly characteristic behavior. A child with a high score is exhibiting much anxious behavior. The authors (1958b) used the scale in a study comparing classroom observations of low and high anxious children. They found an average correlation of .20 between the TASC and the teachers' ratings, significant at the .01 level.

ANALYSIS

The test results were entered on data cards. The data was processed by computer using standard statistical procedures, largely T-tests, analyses of variance, and correlations.

CHAPTER V

FINDINGS AND CONCLUSIONS

The hypotheses formulated in Chapter II are restated hereafter, followed by the pertinent experimental findings.

HYPOTHESIS I

Subjects with a low score on the PATT will have a high score on the GASC.

Findings

The results of GASC-PATT correlational analysis suggest no significant association although the correlations were generally in the proposed direction as indicated in Table 6.

Conclusions

Statistical analysis of the data did not confirm the hypothesis. The GASC did not correlate with the PATT. The GASC correlated with sex, the girls scoring significantly higher than the boys.

HYPOTHESIS II

Subjects with a low score on the PATT will have a high score on the teachers' rating scale.

Findings

Teachers' ratings of anxiety were available for the

TABLE 6

GASC-PATT CORRELATIONS

PATT TASK	GASC-PATT r	P
1	-.12	NS
2	-.11	NS
3	-.01	NS
4	-.06	NS
5	.17	NS
6	.01	NS
Total	-.02	NS
Age	-.07	NS
Sex	.42	.01

thirty subjects from Devon. The correlation between the ratings and the total PATT scores is -0.30, significant at the .05 level.

Conclusion

Statistical analysis of the data confirmed the hypothesis. A low score on the PATT, indicative of a high level of anxiety, correlated with a high score on the teachers' rating scale, also indicative of a high level of anxiety.

HYPOTHESIS III

Subjects with a low score on the PATT will have a low score on the WRAT subtests.

Findings

Each subtest score and the total score of the PATT correlated significantly with the three subtest scores of the WRAT - reading, spelling and arithmetic as shown in Table 7. The results are based on an N of 59.

TABLE 7

CORRELATIONS BETWEEN WRAT SUBTESTS AND PATT TASKS

PATT TASKS	READING	SPELLING	ARITHMETIC
1	.52	.50	.53
2	.51	.42	.52
3	.49	.46	.46
4	.29	.30	.34
5	.47	.47	.54
6	.43	.47	.43
Total	.65	.63	.68

Conclusion

Statistical analysis of the data confirmed the hypothesis that a low score on the PATT, indicative of high anxiety, correlated with a low score on the WRAT subtests,

indicative of low achievement. High anxiety, then, correlated with low achievement.

Additional Information

To prevent the advancement of a counterhypothesis that the PATT is simply a measure of achievement, additional analysis was performed. It will be recalled that the emotionally disturbed group had higher anxiety scores than the normal group on the PATT. However, a comparison of the achievement subtest scores between the emotionally disturbed subjects and the normal subjects revealed no differences on the reading and spelling subtests as indicated in Table 8.

TABLE 8

SUMMARY OF DIFFERENCES BETWEEN ACHIEVEMENT SCORES FOR EMOTIONALLY DISTURBED AND NORMAL CHILDREN

WRAT SUBTEST	EMOTIONALLY DISTURBED			NORMALS			DIFFERENCES		
	N	X	SD	N	X	SD	DF	T	P
Reading	12	55.25	13.06	32	57.50	13.70	42	.49	.31
Spelling	12	33.83	9.81	32	36.69	7.37	42	1.04	.15
Arith-metic	12	24.50	5.13	43	27.84	3.88	42	2.33	.01

Thus, the PATT is not another test of achievement but has the power to differentiate on the basis of anxiety. The

significant difference between the arithmetic scores of the two groups may be related to the influence of short-term memory on arithmetic ability and subsequently to the interfering effect of anxiety on memory span.

CHAPTER VI

DISCUSSION AND IMPLICATIONS

Anxiety and the PATT

The present study has shown that anxiety in children is open to assessment via task performance. The results summarized in Chapter V suggest that the PATT has validity as a measure of anxiety. PATT scores co-varied with achievement scores supporting the finding reported in the review of literature that anxiety correlates negatively with achievement. PATT scores co-varied with teacher estimates of anxiety. PATT scores did not co-vary with self-report scores, however, and some discussion of this finding is warranted.

Contradicted Hypothesis

No correlation was found between PATT and GASC scores. the GASC has a number of limitations as a measure of anxiety which may reveal why the first hypothesis was not confirmed. The questions are answered with a yes or a no, not allowing the child to make any qualifying remarks about his response. Some of the questions would likely be answered positively by either a child applying common sense or by an anxious child. The anxiety sampled by the GASC may be confined to the specific situations described and may not be related to the child's behavior in other situations such as his performance in school.

The GASC, in contrast to the PATT, did not differentiate

between the emotionally disturbed and normal groups. The normal children were found no different from the disturbed children in terms of scores on the GASC. The normal children may just be more willing to admit their fears. The GASC, again in contrast to the PATT, found the girls more anxious than the boys. Girls, too, may just be more willing to admit their fears. Being a performance scale, the PATT reduces the influence of the child's test-taking attitude, such as his willingness to admit that he is afraid. The PATT, it could be contended, provides a more accurate measure of a child's level of anxiety.

Researchers appear to assume that the face validity of the GASC is sufficient to warrant its use. The limitations presented here detract from the validity of the GASC as a measure of anxiety.

The Teachers' Rating Scale may be a valuable measure of anxiety particularly if its completion is preceded by a training session. The teachers and examiner could discuss each item, applying the questions to typical classroom situations and interpreting the rating scale in these situations. Otherwise, ratings may vary too greatly between teachers.

IMPLICATIONS

The PATT and Counseling

The PATT appears to be a valuable diagnostic instrument for the counselor or school psychologist, providing

a quick measure of a child's level of anxiety. A non-verbal test, the PATT can be used with children from ages five to ten years. A performance test, the PATT consists of tasks similar to school activities. With the PATT, the clinician could possibly determine to what extent anxiety is interfering with a child's performance and then work towards its amelioration.

The PATT and Research

Further research with a larger sample needs to be undertaken to establish more extensive validation of the PATT. A physiological measure of anxiety such as Galvanic Skin Resistance could be employed for comparison with the PATT. Another type of self-report, tapping the child's personal anxiety reactions, could be employed as well.

The PATT appears to be a logical substitute for the anxiety scales used in research studies. The materials for the test kit can be made largely from coloured cardboard. The test is easy to administer and score and has the characteristics of a satisfactory measuring instrument.

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APPENDIX

PATT RECORD FORM

NAME_____

BIRTHDATE_____ AGE_____ SEX_____

ADDRESS_____

SCHOOL_____ TEACHER'S NAME_____ GRADE__

EXAMINER_____ DATE_____

SUBTEST	RAW SCORE	TOTAL SCORE___
1. Hidden Objects	_____	
2. Tower-building	_____	
3. Card-sorting	_____	
4. Oval Assembly	_____	
5. Memory Span	_____	
6. Sequential-picture-making	_____	
Total	_____	

NOTES: (including comments about the testing conditions, child's remarks, and examiner's observations)

ADDITIONAL INFORMATION: (e.g. Is the child on medication? What other children are in the family?)

---

1. HIDDEN OBJECTS (180")

		Score 1 or 0
1.	Rabbit's head	_____
2.	Comb	_____
3.	Tree	_____
4.	Carrot	_____
5.	Basket	_____
6.	Duck	_____
7.	Pencil	_____
8.	Glasses	_____
9.	Glove	_____
10.	Turtle	_____
11.	Bell	_____
12.	Egg	_____
13.	Purse	_____
	Total	_____

2. TOWER-BUILDING

Task	Time	Score
1.	____	____
2.	____	____

0 1 2 3 4 5 6 7 8 9 | 31-40: 10 | 21-30: 11 | 0-20: 12

Total = $\frac{\text{Score \#1} + \text{Score \#2}}{2}$ = _____

3. CARD-SORTING (180")

Pile	Number correct
1	_____
2	_____
3	_____
Score	_____
Time	_____

Total

0 1 2 3 4 5 6 7

41-60: 8 | 26-40: 9 | 0-25: 10

4. OVAL ASSEMBLY (180")

Score_____ + 2 = _____

Time _____

Total

0 1 2 3 4 | 61-80: 5 | 41-60: 6 | 0-40: 7

5. MEMORY SPAN

Score_____ x 2 = _____

6. SEQUENTIAL PICTURE MAKING (120")

Score _____

Time _____

Total

0 1 2 3 4 5 | 36-50: 6 | 21-35: 7 | 0-20: 8

INTRODUCTION

Introduce the test by saying "I have some things for you to do. They are something like games but I want you to do as well as you can and I want you to work as fast as you can."

Directions may be repeated if the child asks.

1. HIDDEN OBJECTS

MATERIAL: Sheet 8½" by 11" with a picture of a girl raking the grass between a fence and a stone path.

PROCEDURE: "Look at this picture. Can you see some things hidden in the picture? Show me one." Let the child point out one object and say "Yes, that's a _____ hidden in _____." If the child cannot find anything, trace around the rabbit's head saying "Here's the head of a rabbit hidden in the top of the tree." Then continue with "Look at the picture carefully. Find as many hidden things as you can." Give the child one encouragement. "Can you find anything else?"

SCORING: Score one point for an adequate identification of each hidden object, that is, an appropriate name, description or indication by pointing.

MAXIMUM SCORE: 13

TIMING: Allow a maximum of three minutes after checking the child's first response.

2. TOWER-BUILDING

MATERIAL: 27 coloured cubes in a box.

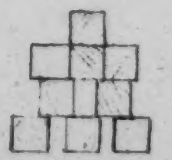
PROCEDURE: 1. Give the child 15 blocks. Say "Make a tower like this." Demonstrate a single tower with three blocks. "Make a tower as high as you can. You can only make one tower." Count the number of blocks.

2. "I am going to build another tower behind this paper. When I show it to you, build one exactly the same as fast as you can." Build a tower like the one illustrated at the bottom of the page. Expose the tower and say "Make a tower just like mine. Don't worry about the colours. Build it as fast as you can. Go ahead." Keep time.

SCORING: Add the number of blocks in the first tower and the number of blocks correctly placed in the second tower, including a time bonus ÷ 2.

MAXIMUM SCORE: 14

TIMING: No time limit on part one; measure the time required on part two.



3. CARD-SORTING

MATERIAL: 13 square cards with variations of circles, triangles, and circle and triangle combinations glued on.

PROCEDURE: On a sheet 5½" by 8½" in front of the child, draw a circle and ask the child "Do you know what this is? (Yes), it's a circle." Draw a triangle and ask the child "Do you know what this is? (Yes), it's a triangle." Leave the paper in front of the child, and give him the pile of cards, in order from one to thirteen with one on top and turned upside down until the instructions are finished and timing begins. "Put these cards into three piles so that the cards in each pile are alike. The cards in this pile should look like they belong together; the cards in this pile should look like they belong together; and the cards in this pile should look like they belong together." Touch three imaginary piles in front of the child as the instructions are given. "Go ahead. Tell me when you are finished." Keep time and count the number correct.

SCORING: Half the number correct plus a time bonus if applicable.

MAXIMUM SCORE: 10.

TIMING: Keep time. Allow a maximum of three minutes.

4. OVAL ASSEMBLY

MATERIAL: A cardboard sheet with an oval, divided into eight different coloured shapes and eight puzzle pieces which match the shapes on the oval.

PROCEDURE: "See these puzzle pieces. They fit together to make this large egg." Quickly trace around the oval with your hand. "Put each piece in the space which has the same shape." Pick up the largest piece and move it across the oval. "Work as fast as you can. Tell me when you are finished." Keep time.

SCORING: ½ point for each piece placed correctly and bonus points if applicable.
MAXIMUM SCORE: 7.

TIMING: Allow a maximum of three minutes.

5. MEMORY SPAN

MATERIAL: A grey pegboard, a container of coloured chips with a hole in the centre, and two booklets with different numbers of these chips glued on the pages.

PROCEDURE: Have sixteen chips available, two of each colour. "See these coloured chips. They fit on the pegs like this." Demonstrate with a grey and a yellow chip along the first row. "I am going to show you a card with some chips on it. Look at the card. When I take it away put the same chips on the pegs. Look." Show card 2a for 2 seconds (count one... two, slowly). If the child is not successful on his first try show him the card again and explain that a red chip goes here and a black chip goes here, then they are the same. Show card 2b for 2 seconds. If the child fails again stop, if he succeeds go on to card 3a. Continue trial 'a' if the child succeeds. If he fails, give trial 'b'. If he passes trial 'b' continue in the 'a' series again; if he fails trial 'b', stop.

SCORING: Count the number or chips the child can remember and multiply by 2.

MAXIMUM SCORE: 16

TIMING: Allow the child to view the card for 2 seconds if there are two chips on it, 3 seconds if three chips, 4 seconds if four chips, and so on.

6. SEQUENTIAL-PICTURE-MAKING

MATERIAL: 7 cards with incomplete pictures on either end of the cards.

PROCEDURE: Place cards 2 - 7 in a row with card 1 above card 3. Say "Look at this card. Can you find the card which goes next, the card which goes here to finish this picture? (Yes), this one goes here. See how the two cards fit together to make this picture. Join the other cards together the same way to make one long line.". Keep time.

SCORING: 1 point for each correct join and a time bonus if applicable.

MAXIMUM SCORE: 8.

TIMING: Measure the time required to complete the task with two minutes total time limit.